GIS System Application

2003 National Site Assessment Symposium

Tetra Tech EM Inc.

Why Develop GIS Database?

➢ Ease of interpretation of large data sets

➢ Case in Point – Kansas Army Air Field

   ➢ 4,000-acre FUD site

   ➢ Investigated by multiple parties over a 10 year period

   ➢ 4 major investigations; 12 lesser investigations

      ➢ Over 2,500 multi-media samples collected; over 100,000 data points

   ➢ 37 Areas of Interest, widespread PAH, Metals, and VOC Contamination

HRS Documentation Package

➢ Challenges related to scoring the site
  ➢ No institutional knowledge of the site
  ➢ Incomplete/Disorganized data sets
  ➢ Wide range of graphics quality
  ➢ No comprehensive database
  ➢ Multiple reams of hard copy reports

The Challenge
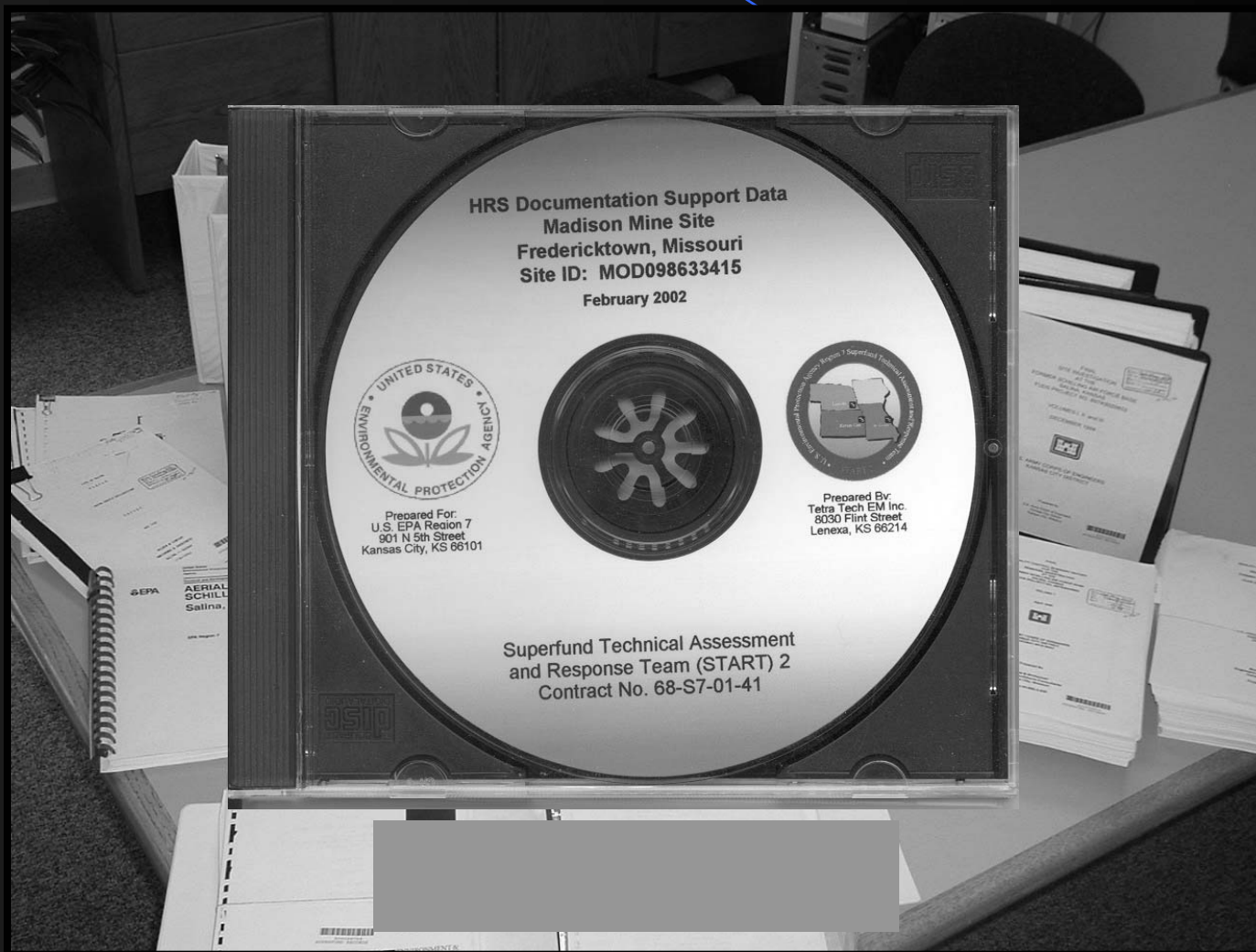
Multiple Map and Data Presentation Formats

233

Activity Number: DJB01   ASR Number: 766   RLAB Approved Sample Analysis Results

Activity Desc: ESI Sampling   10/20/2000

Analysis / Analyte	Units	240-__	241-FB	242-__	243-__
VOCs in Water by GC/MS for Low Detection Limits					
Acetone	ug/L	4 U	13 U		
Benzene	ug/L	1 U	1 U		
Bromodichloromethane	ug/L	4.6	1 U		
Bromoform	ug/L	1 U	1 U		
Bromomethane	ug/L	2 U	2 U		
2-Butanone	ug/L	4 U	4 U		
Carbon Disulfide	ug/L	1 U	1 U		
Carbon Tetrachloride	ug/L	1 U	1 U		
Chlorobenzene	ug/L	1 U	1 U		
Chloroethane	ug/L	2 U	2 U		
Chloroform	ug/L	3.6	1 U		
Chloromethane	ug/L	2 U	2 U		
Dibromochloromethane	ug/L	3.5	1 U		
1,2-Dichlorobenzene	ug/L	1 U	1 U		
1,3-Dichlorobenzene	ug/L	1 U	1 U		
1,4-Dichlorobenzene	ug/L	1 U	1 U		
1,1-Dichloroethane	ug/L	1 U	1 U		
1,2-Dichloroethane	ug/L	1 U	1 U		
1,1-Dichloroethene	ug/L	1 U	1 U		
cis-1,2-Dichloroethene	ug/L	1 U	1 U		
trans-1,2-Dichloroethene	ug/L	1 U	1 U		
1,2-Dichloropropane	ug/L	1 U	1 U		
cis-1,3-Dichloropropene	ug/L	1 U	1 U		
trans-1,3-Dichloropropene	ug/L	2 U	2 U		
Ethyl Benzene	ug/L	1 U	1 U		
2-Hexanone	ug/L	4 U	4 U		
Methylene Chloride	ug/L	4 U	4 U		
4-Methyl-2-Pentanone	ug/L	4 U	4 U		
Styrene	ug/L	1 U	1 U		
1,1,2,2-Tetrachloroethane	ug/L	1 U	1 U		
Tetrachloroethene	ug/L	1 U	1 U		
Toluene	ug/L	1 U	1 U		
1,1,1-Trichloroethane	ug/L	1 U	1 U		
1,1,2-Trichloroethane	ug/L	1 U	1 U		
Trichloroethene	ug/L	1 U	1 U		
Vinyl Chloride	ug/L	2 U	2 U		
m and/or p-Xylene	ug/L	1 U	1 U		
o-Xylene	ug/L	1 U	1 U		

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The Consequence

➢ The HRS package

    ➢ Understanding of the site is problematic

    ➢ Excessive time spent locating critical data

    ➢ Problems accurately locating sample points

    ➢ Understanding relationships between sources, samples, and targets

GIS Functions

➢ Systematic approach to environmental information collection

➢ Reduction in costs and overlap of information

➢ Comparability and compatibility

➢ Wider audience

➢ Spatial analysis of environmental impacts

Integrating Projects

➢ Integrated approach
  ➢ Site Assessment Use
  ➢ Removal Assessment Use
  ➢ Subsequent uses; remedial activities, community relations

Planning and Pre-Financing

➢ Review site needs

➢ Conduct cost-benefit analysis early

➢ Procure an appropriate analytical laboratory

➢ Actual planning and design

GIS Database Benefits

➢ Short Term

   ➢ Dynamic Decision Making Ability

   ➢ Expedite Site Evaluation Process

   ➢ Limited Critical Data Collection

   ➢ Effective Biased-Sampling (focus areas with high probability of contamination)

GIS Database Benefits

- Long Term
  - Institutional or programmatic applications
  - Subsequent project benefits
  - Data easily stored and disseminated

Decision Chart
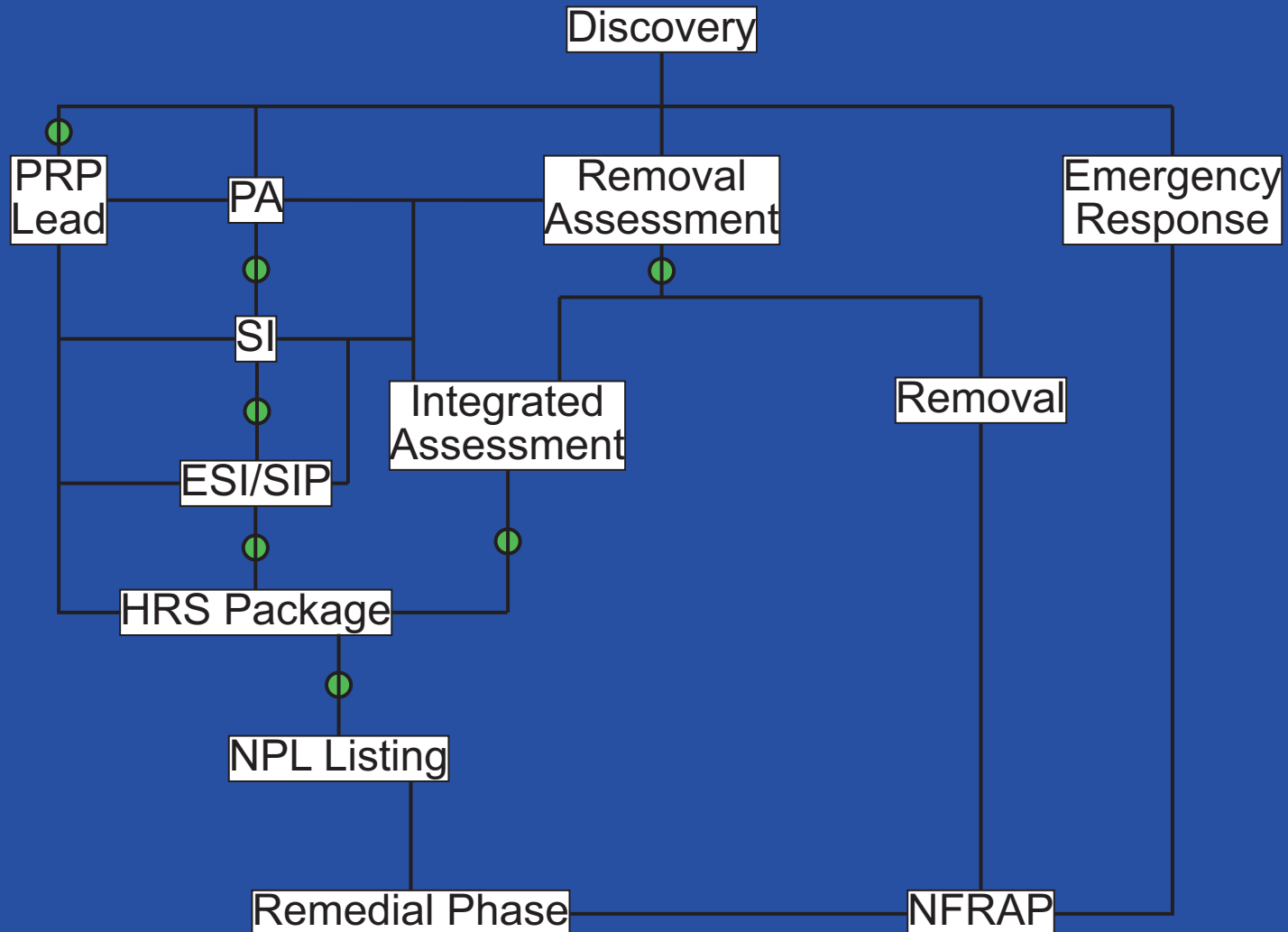
Software

➢ArcView 3.2a and ArcMap 8.2

➢Microsoft Access

    ➢Highly compatible

    ➢Leading manufacturers

    ➢Supporting information

Database Design

Sample Type

Sample Coordinates

Graphics

Sample Data

Sample Description

HRS Samples With Analytical Data

Find Record   Save Record

Click on File Name Below to See Main Photo

C:\Projects\MdisnHRS\Photos\H-1SE.bmp

Y: 4160839.6435975   X: 738993.25551758
Lat: 37 33 48.97279   Long: -90 17 38.81889

Sample ID: H-1

Sample Type: Surface Soil

Photo Caption
Sample taken from chat driveway in foreground of photograph.

Extra Photos
Click on File Name to See Extra Photos

Sample Description
Surface soil sample (grab) taken from chat driveway at residential property in Fredericktown, Madison County, Missouri.

Comments

Record: 1 of 1

ANA...

Un... alents.   Sample ID: H-1

Lab Codes

Lab Code:

Element	Value		Element	Value
Antimony	0.99		Cobalt	65
Arsenic	12		Copper	120
Barium	70		Lead	2200
Beryllium	0.67	J=	Manganese	5100
Cadmium	0.31		Mercury	0.032
Chromium	7.1		Nickel	73

Record: 1 of 103

Key Aspects of the Database

➢ Centrally stored data is easier to access

➢ Ease of GIS creation and maintenance

➢ Automated field population

➢ Forms and queries ease data manipulation

➢ Definitive historical record

➢ Cost savings benefits

GPS in GIS

➢ GPS offers a wide variety of accuracies

➢ Feature coding allows for pre-planned site specific information to be collected

➢ Additional features can be mapped using GPS
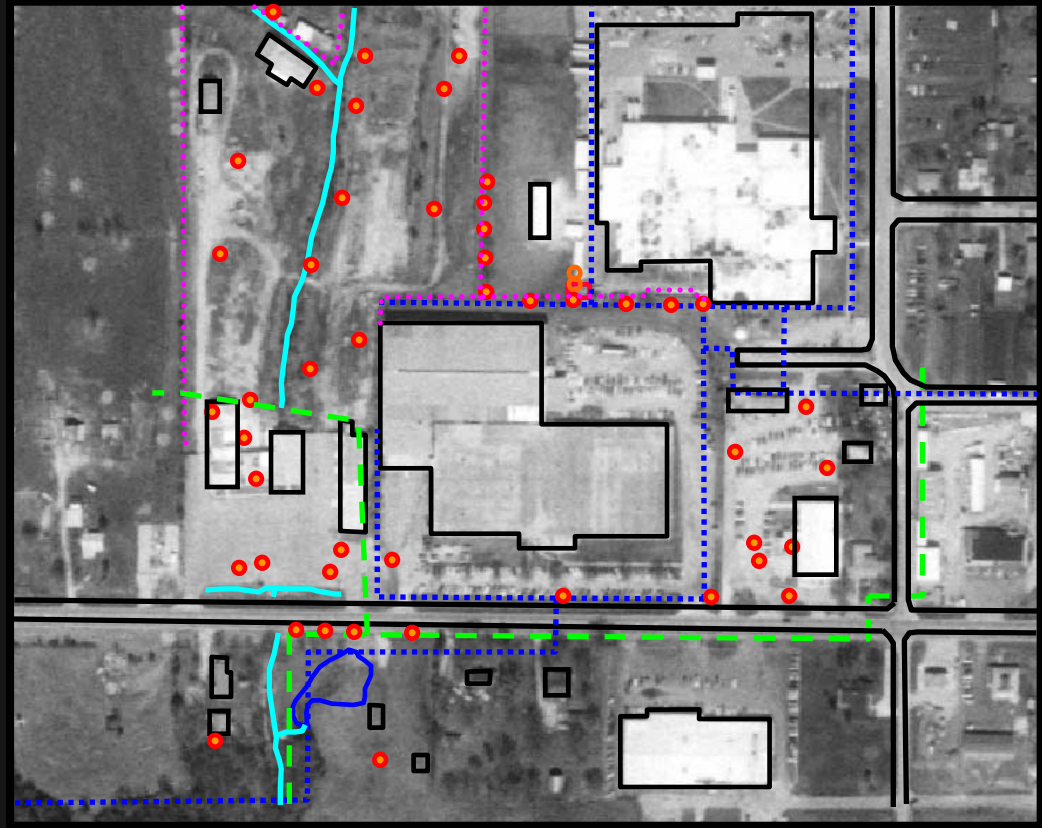
➢ Features surveyed are tied to real world coordinates

Base Map Options

➢Aerial Photos

➢USGS Topos

➢Vector Based Topos

➢NWI Maps

➢Soils Maps

➢FEMA Maps

➢Combinations
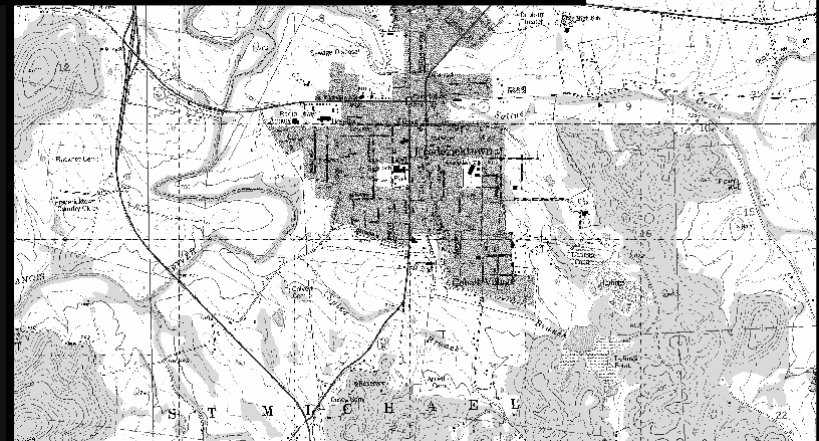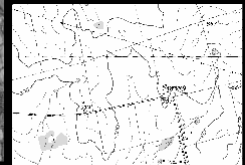
Types of Data in GIS

- Points – Sample location points, manholes, etc.

- Lines – Streams, fences, water lines, roads, etc.

- Polygons – Source Areas, buildings, water features, etc.
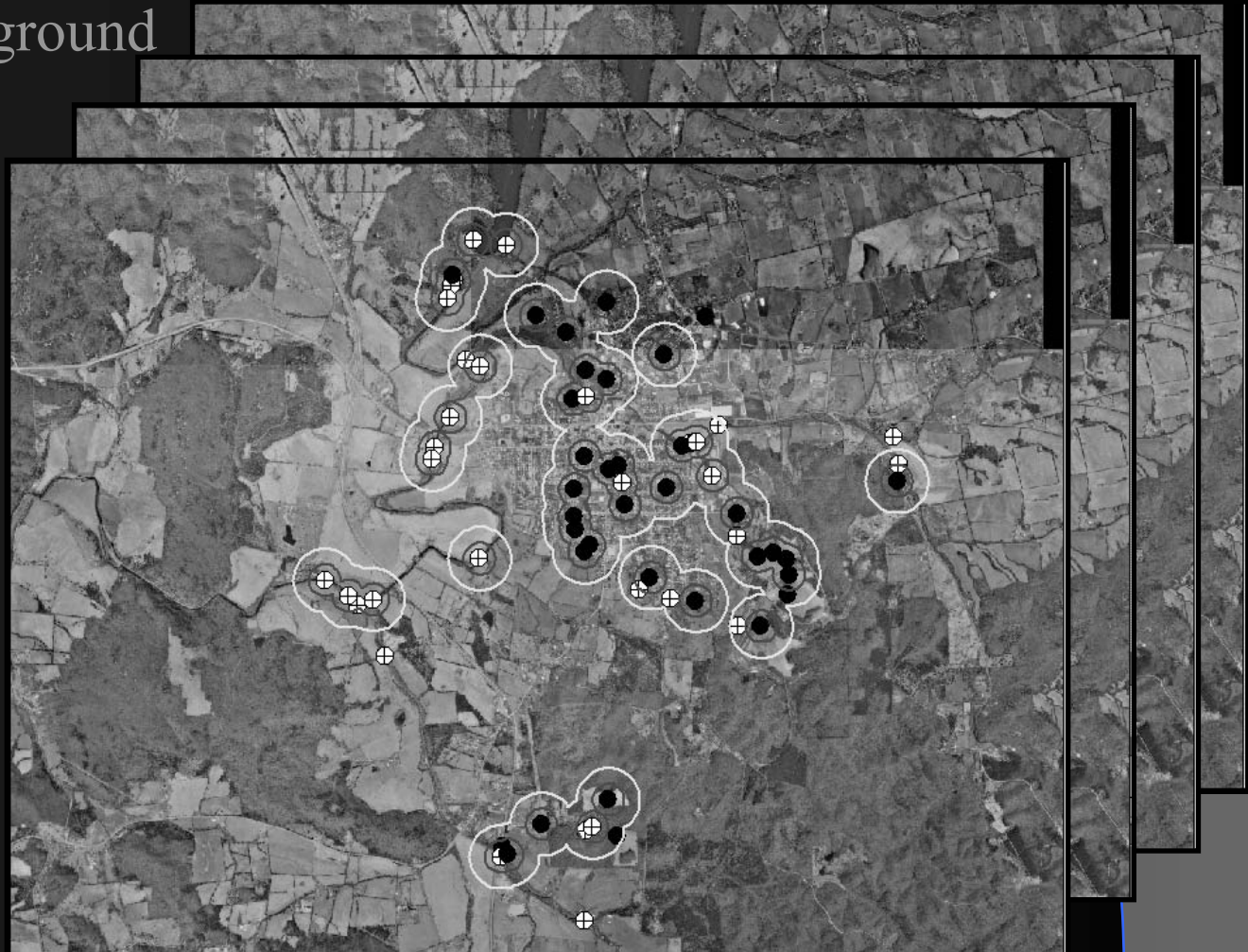
Querying Data

- Spatial Queries
  - Single selection
  - Multi selection
  - Identify tool
- Attribute Queries
- Combined Spatial and Attribute

What Next?

- Viewing Results
  - Color Ranges
  - 3 Times background
  - Contouring
  - Buffering

Client Deliverables

➢ Hard copy maps

➢ Various media types and sizes

➢ Disc

➢ For the ArcView user

➢ ArcReader

➢ For those that lack the software or personnel

Savings

➢ Reduced retracing costs